



Exceedance of heat index thresholds for 15 regions under a warming climate using the wet-bulb globe temperature

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Abstract:

Thermal comfort is quantified in 15 regions using the wet-bulb globe temperature (WBGT), examining past and future rates of thresholds exceedance corresponding to moderate, high, and extreme heat (28, 32, and 35 degrees C, respectively). As recent changes to thermal comfort appear to be dominated by temperature and humidity, a WBGT approximation based only on these is used. A new homogenised dataset from 1973 to 2003 is developed which provides WBGT daily means, daily maximums averaged over 5-day periods, and the highest extreme for each 5-day period; recent trends are positive for all regions except northeast USA and northeast Australia. A simple model for predicting summertime threshold exceedance rates, with a fixed distribution of anomalies about the seasonal mean, is found to adequately predict changes for the above quantities given seasonal mean values. This model is used to predict the impact of regional 15 degrees C temperature increases on WBGT exceedance rates with no change in relative humidity. Results show that heat events may worsen as much, or more, in humid tropical and mid-latitude regions even if they warm less than the global average, due to greater absolute humidity increases. A further 2 degrees C warming from the present is sufficient to push peak WBGT above 35 degrees C, an extreme heat event, in all regions except the UK. An ensemble of HadCM3 climate model simulations is used to investigate likely regional changes in mean summertime temperature, relative humidity and WBGT under an A1B scenario for the 2020s and 2050s. Unsurprisingly, simulated regional changes often depart significantly from the global average, and the impact of regional changes in relative humidity is not always negligible. Increases in WBGT are nonetheless expected in all regions, and are more predictable than increases in temperature at least in mid-latitude regions owing to the compensating effects of humidity. (C) 2010 Royal Meteorological Society and Crown Copyright.

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Resource Description

Climate Scenario : ☒

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: HadCM3 A1B

Early Warning System: ☒

resource focus on systems used to warn populations of high temperatures, extreme weather, or other

Climate Change and Human Health Literature Portal

elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

Meteorological Factors, Temperature

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Medium-Term (10-50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

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